follows also that their mean distances are correspondingly smaller. This conclusion might indeed fail here and there in particular cases, but, as applied generally to these two classes of bodies, is entirely valid.

Accordingly, we see that in the universe generally small eccentricity is connected with the small mean distance, and *vice versa*. This confirms, from an observational standpoint, the theory of the development of these systems long ago inferred from other considerations (*cf.* the writer's *Inaugural Dissertation*, Berlin, 1892). Heretofore scarcely anyone has dared to hope that a direct confirmation of this theory would ever be possible; but, unless this reasoning is entirely at fault, such a positive confirmation is near at hand, and is due to the notable advance in our knowledge of the stars arising from the discovery and investigation of spectroscopic binaries, chiefly during the past ten years.

U.S. Naval Observatory,
Mare Island, California :
    1907 *November* 30.

Micrometrical Measures of Double Stars (Fifth Series). By the Rev. T. E. Espin, M.A.

In the early part of 1907 very few known double stars were measured, pending the arrival of Burnham's General Catalogue. The latter part of the year has been devoted to the completion of measures of new pairs, and to the measurement of such stars of Sir John Herschel's as have not been remeasured since his observation of them. The places are those of the General Catalogue (1880); but in several cases, as explained in the notes, corrections to Herschel's places have been made.

h.	R.A. 1880.	Decl.	P.	D.	Mags.		Nights.	Date.	
	h m	° ′	°	″					
1009	0 9·6	+47 56	26·7	16·77	9·0,	9·1	2	1907·760	A B
			140·9	36·15		11·7	2	·760	A C
1029	25·9	44 16	279·9	11·85	8·8,	10·4	3	·905	
1985	28·4	48 11	143·3	17·97	10·0,	10·2	2	·851	
1049	38·0	50 6	303·1	15·32	9·2,	11·0	3	·784	
1050	38·1	44 23	185·1	13·97	9·7,	10·7	2	·896	
1058	51·0	49 34	283·7	11·70	10·2,	10·3	3	·862	
1060	52·0	44 16	293·1	9·48	9·5,	10·7	4	·924	
2013	59·2	44 8	247·0	23·22	8·5,	11·5	2	·891	
2031	1 9·6	43 49	260·6	20·15	8·5,	12·7	2	·903	BC
			342 2	45·52	A =	8·0	2	·903	AB

h.	R.A. 1880. h m	Decl. ° ′	P.	D.	Mags.	Nights.	Date.
1077	1 10·7	+44 0	295·2	38″·05	8·0, 9·6	2	1907·903
2144	2 25·0	48 20	259·4	26·22	8·6, 9·5	2	·880
2232	4 22·4	47 2	325·3	13·42	8·8, 10·5	2	·924
2237	36·1	47 26	123·0	15·90	9·1, 11·6	2	·942
2239	39·4	45 58	162·2	13·52	9·5, 10·5	2	·942
2248	58·2	47 11	333·1	14·92	8·8, 11·0	2	·994
2249	5 1·1	47 21	97·2	14·20	8·8, 9·4	2	·942
2264	21·7	47 49	125·8	5·70	8·4, 9·5	2	·942
378	6 0·2	28 58	257·2	12·27	9·0, 9·0	2	·115
379	1·3	31 17	117·3	9·85	7·0, 11·5	1	·041
460	8 45·3	28 43	333·7	43·72	7·5, 11·0	2	·183
803	56·7	28 4	9·4	11·62	9·2, 11·5	2	·232
495	9 12·9	35 46	135·2	15·81	11·0, 11·0	2	·216
2857	19 7·0	41 35	177·5	14·40	8·0, 13·5	1	·756 AB
			210·9	36·60	12·0	1	·756 AC
1460	53·6	46 28	87·2	6·87	9·9, 11·0	2	·835
1463	55·9	45 29	313·1	10·20	9·8, 11·5	3	·897
1481	20 1·8	49 3	7·2	17·40	10·0, 10·1	2	·842 BC
			88·0	27·62	A = 9·7	2	·842 AB
1584	45·6	47 38	224·0	3·75	9·0, 10·0	2	·770
1594	50·4	47 6	48·6	8·78	9·0, 10·1	4	·878
1604	56·1	48 43	135·5	25·67	10·2, 11·0	2	·825
1651	21 24·5	47 38	230·0	10·95	9·4, 10·1	2	·828
1657	28	47 54	See Note				
1676	35·1	46 39	135·0	29·22	8·4, 9·7	2	·926
1681	35·6	47 52	109·9	7·35	9·0, 9·1	2	·770
1692	42·0	46 39	249·6	11·75	10·5, 11·5	3	·930
1698	44·9	46 43	325·6	7·62	9·1, 12·0	3	·930
1701	46·9	46 32	195·3	11·42	9·7, 10·7	2	·951
1705	49·8	46 29	37·6	3·07	11·9, 13·5	2	·904
1712	55·3	48 8	176·7	9·30	9·4, 9·5	3	·786
1738	22 4·5	45 53	178·9	9·57	10·6, 11·7	2	·932
1762	18·5	47 48	88·4	14·70	9·7, 13·7	2	·770 BC
			354·9	18·35	A = 9·1	2	·770 AB
1766	21·8	49 41	265·2	13·32	9·0, 10·1	2	·806

h.	R.A. 1880. Decl.		P.	D.	Mags.	Nights.	Date.
	h m	° ′	°	″			
1772	22 23·5	+45 32	103·5	6·05	9·6, 10·2	2	1907·910
1793	33·1	46 25	291·5	13·95	10·0, 11·7	2	·910
1794	33·2	46 22	315·0	21·80	9·4, 11·0	2	·910
1795	33·3	46 43	213·8	12·07	10·7, 11·5	2	·910 BC
			209·8	16·10	A = 10·2	2	·910 AB
1797	34·6	49 30	125·4	14·10	9·7, 11·0	2	·951
1814	44·1	47 57	76·1	14·10	9·0, 10·2	2	·782
1863	23 10·4	48 21	51·1	8·57	11·5, 12·5	3	·813
1878	21·3	49 46	268·2	8·87	10·5, 10·7	2	·858
1883	21·9	45 44	145·4	18·55	9·3, 9·6	2	·903
1893	29·2	46 50	247·0	4·47	8·6, 8·7	3	·795
1917	48·7	45 6	76·2	12·92	8·9, 12·2	2	·935
1923	54·3	50 3	277·6	10·77	11·5, 11·8	2	·918
1927	57·0	44 28	76·6	14·75	8·6, 8·9	2	·951
1931	58·0	49 18	113·1	21·90	8·0, 10·7	2	·759

Notes.

h 1009   is BD + 47°, 40, C not given by *h*.

h 1029   is BD + 44°, 110, *h*'s place one min. too small in R.A.

h 1985   is BD + 48°, 172.

h 2013   is BD + 44°, 232, *h*'s angle 256°·0.

h 2249   a small star at P 306°, D 119″ is double and is No. 467 of the list of new pairs.

h 2857   the nearer *comes* is not in *h*.

h 1460   22^s·2 *p* 43″·7 N of BD + 46°, 2817.

h 1657   *h* says "10° ± 10″ ± in a cluster." I have looked for this on several nights, but have failed to find any such pair. The only pair that bears any resemblance is one at P 16°·3 D 101″ from BD + 47°, 3439 (Aitken 770) which I have measured as follows :—

P 39°·7, D 7″·00, mags. 9·5, 10·7, 2 nts. 1907·884.

h 1705   This is 13^s·6 *f* 2′·5 N of BD + 46°, 3480, and if identical with *h* 1705 *h*'s place is 1 min. too great. His observation is "P 80°·4, D 3½″, mags. 11–12, 14, difficult." I could not find any other pair here.

h 1762   Star C not given by *h*.

h 1795   *h* says, "? if a 4th star." No such star seen on either night, save a distant brighter one n.p.

h 1863   *h* reversed angle and says "difficult to measure."

h 1893   This is BD + 46°, 4082, and *h*'s place requires a correction in Decl. of + 30′. His angle is the mean of 250°·6 and 252°·6. The star BD + 46°, 4083, is in the field 8^s·8 *f* 73″·45 N at an angle of 51°·6.

Various Stars.

Name.	R.A. 1880. h m	Decl. ° ′	P.	D.	Mags.	Nights.	Date.
η Cassiopeiæ ...	0 41·7	+57 11	236·4	5·67		2	1907·043
			236·1	5·72		2	·990
Espin 44 ...	49·8	56 51	250·1	7·40	8·3, 12·0	3	·341
φ Cassiopeiæ...	1 12·5	57 36	264·8	41·54	7·0, 11·0	2	·107 CD
			231·1	132·93	A= 5·0	2	·107 AC
A.G. (Bonn) ...	51·7	50 1	355·2	13·62	9·0, 9·1	2	·774
A.G. (Bonn) ...	3 17·3	46 36	315·0	10·67	8·5, 9·2	2	·957
Espin 57 ...	4 47·4	47 27	175·9	2·27	9·5, 9·9	3	·942 AB
			61·3	16·52	C= 14·0	2	·940 AC
A 1316 ...	5 54·5	30 0	181·0	4·68	8·5, 11·7	3	·121
Rümker 4 ...	6 12·8	29 43	273·2	5·50	9·0, 9·2	2	·115
6 Cancri ...	7 56·8	28 8	187·5	60·06	5·0, 12·0	2	·232 AB
			81·0	78·63	C= 11·0	2	·232 AC
Σ 1321 ...	9 6·4	53 13	66·5	18·82		2	·202 AB
			282·7	28·44	C= 14·0	2	·202 AC
Küstner 40 ...	11 42·6	34 22	182·6	3·12	8·9, 9·2	2	·216
12 Comæ ...	12 16·5	26 31	54·0	34·91	4·5, 11·5	3	·240 AB
			167·5	64·66	C= 8·0	2	·235 AC
A.G. (Bonn)...	18 54·7	47 2	229·0	2·37	8·3, 8·4	3	·846
Lewis 32 ...	19 56·1	29 36	128·0	3·17	9·8, 10·0	3	·724
Arg. 39 (Espin 92)	20 38·7	48 50	113·2	9·67	8·2, 8·6	3	·778 AB
			125·1	30·98	C= 12·0	4	·714 BC
			232·0	33·47	D= 14·0	2	·893 BD
+ 48°,3995 ...	23 13·5	48 16	231·6	49·10	7·3, 8·8	2	·799

Notes.

φ Cassiopeiæ CD may be the pair measured by H as 271°·8.

A. G. III. 17·3.   The note in Bonn Observations "Dupl. 3″ med." may refer to Σ 371, 7 min. p.

A 1316.   Detected and measured before Professor Aitken's results reached me.   He calls the *comes* 14·2 mag.

Rümker 4.   This is BD + 29°, 1181, 6′ N of Rümker's place.

6 Cancri.   A star mentioned in "Celestial Objects" as having two *comites* detected by Birmingham.

Σ 1321.   The minute *comes* was first seen 1901 Jan. 22.

12 Comæ.   The nearer *comes* previously seen by Burnham.

Lewis 32.   This is BD + 29°, 3849.

Arg. 39.   After charting all the available measures, I find a motion for B of 0″·216 towards 221°·5.   C, measured by Burnham, is almost at right angles to the line of motion.   I have added the still fainter star D, as being nearly in the direction of motion.

New Double Stars.   By the Rev. T. E. Espin, M.A.

No.	B.D.	R.A. 1900.	Decl.	P.	D.	Mags.		Nights.	Date.
		h m	° '	°	"				1907.
443	+48,5	0 0·8	+49 10	32·9	4·27	8·7	9·9	2	·740
444	+44,126	31·4	44 57	192·5	2·93	9·1	9·6	3	·968
445	+44,130	32·6	44 54	349·7	3·32	9·0	11·0	3	·968
446	+49,182	40·2	49 18	256·1	10·12	8·4	9·0	2	·867
447	+49,186	41·1	49 43	277·9	5·60	8·5	11·7	2	·836
448	...	59·1	50 2	81·3	2·50	9·5	9·7	2	·774
449	+49,352	1 13·8	49 58	212·8	11·20	8·5	9·1	3	·876
450	+47,414	21·7	47 37	147·4	9·52	8·0	13·5	2	·759 AB
				268·9	20·10	C =	13·0	2	·759 AC
451	+49,386	21·8	49 57	65·1	1·97	9·1	9·2	3	·886
452	+49,420	31·7	50 8	176·2	2·62	9·4	11·3	2	·881
453	+44,387	48·9	44 50	259·0	4·45	8·5	11·2	2	·994
454	+49,514	53·2	50 7	132·2	8·65	8·5	10·0	3	·786
455	+49,637	2 14·0	49 41	135·6	4·54	9·2	13·0	2	·850
456	+49,665	21·0	50 2	269·8	3·28	9·1	11·4	3	·821
457	+49,671	22·2	49 14	6·7	6·80	7·7	11·5	2	·759
458	+48,701	28·1	48 58	316·8	5·30	9·1	9·9	3	·886 AB
				243·9	24·58	C =	13·5	3	·886 AC
459	+48,708	29·9	48 56	142·7	3·35	8·9	10·2	4	·888
460	+48,711	30·9	48 13	316·8	2·68	9·1	9·3	3	·894 AB
				336·8	18·85	C· =	13·5	1	·909 AC
461	+48,756	40·2	48 40	342·7	8·22	8·5	9·6	3	·900
462	...	3 7·9	49 23	172·9	2·55	9·7	10·4	2	·896
463	+49,891	9·5	49 21	257·3	4·95	9·3	11·7	2	·896
464	+47,806	14·2	47 21	65·8	7·15	9·1	9·2	2	·817
465	+49,1015	38·6	50 7	251·1	7·37	8·7	9·2	2	·896
466	+49,1092	56·7	49 32	57·1	3·95	8·5	11·0	2	·896 AB
				123·4	14·22	C =	12·0	2	·896 AC
467	...	5 2·4	47 25	98·2	1·52	11·0	11·3	2	·940
468	+30,3021	17 30·3	30 3	11·5	2·28	9·2	10·0	4	·613
469	+28,2829	42·8	28 1	140·9	4·41	10·0	13·0	3	·650 BC
				267·5	48·12	A =	8·5	2	·658 AB
470	+27,2943	59·3	27 51	206·5	7·17	8·6	9·8	3	·658
471	+27,2948	18 0·7	27 6	271·4	18·23	7·0	14·0	3	·676 AB
				44·1	30·35	C =	10·0	2	·671 AC
472	+27,2980	9·9	27 57	8·5	3·08	9·1	9·6	2	·655
473	+42,3026	10·0	42 49	158·0	9·63	8·5	10·0	3	·703 BC
				100·3	30·78	A =	8·5	3	·703 AB